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SPECIFICATION FOR CYLINDRICAL PIPETTES FOR BACTERIOLOGICAL EXAMINATION OF MILK

Third Reprint JUNE 1990

(Incorporating Amendment No. 1)

UDC 542.3 : 531.732 : 637.127

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 4 *February* 1963

Indian Standard

SPECIFICATION FOR CYLINDRICAL PIPETTES FOR BACTERIOLOGICAL EXAMINATION OF MILK

First Reprint FEBRUARY 1971
(Incorporating Amendment No. 1)

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Indian Standard

SPECIFICATION FOR CYLINDRICAL PIPETTES FOR BACTERIOLOGICAL EXAMINATION OF MILK

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 20 March 1962, after the draft finalized by the Dairy Industry Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 The need for standardization of cylindrical pipettes for bacteriological examination of milk has been felt by scientific workers and manufacturers of glassware. This standard covers the requirements of cylindrical pipettes commonly used in bacteriological examination of milk.

0.3 In the preparation of this standard, assistance has been derived from the following publications:

B.S. 700 : 1952 Specification for Graduated Pipettes and One-Mark Cylindrical Pipettes. British Standards Institution.

Standard Methods for the Examination of Dairy Products. American Public Health Association, 1953.

0.4 Wherever a reference to any Indian Standard appears in this specification, it shall be taken as a reference to the latest version of the standard.

0.5 Metric system has been adopted in India and all quantities and dimensions in this standard have been given in this system.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960 Rules for Rounding Off Numerical Values (*Revised*). The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

0.7 This standard is intended chiefly to cover the technical provisions relating to cylindrical pipettes for bacteriological examination of milk, and it does not include all the necessary provisions of a contract.

1. SCOPE

1.1 This standard prescribes the requirements and the methods of test for cylindrical pipettes, calibrated for delivered capacity, suitable for bacteriological examination of milk.

2. CAPACITY

2.1 Cylindrical delivery pipettes for bacteriological examination of milk shall be of the following six capacities:

a) 1·0 ml
b) 1·1 ml for delivering successive 0·1 ml and 1·0 ml of milk
c) 1·1 ml for delivering successive 0·1 ml, 0·5 ml and 0·5 ml of milk
d) 2·2 ml for delivering successive 0·1 ml, 0·1 ml, 1·0 ml, 1·0 ml of milk
e) 10 ml
f) 11 ml

3. DEFINITION OF CAPACITY

3.1 The capacity corresponding to any graduation mark is defined as the volume of water at 27°C, expressed in millilitres, delivered by the pipette at 27°C, when emptied as described in Appendix A.

4. SAMPLING

4.1 Representative samples of the pipettes shall be drawn as prescribed in Appendix B

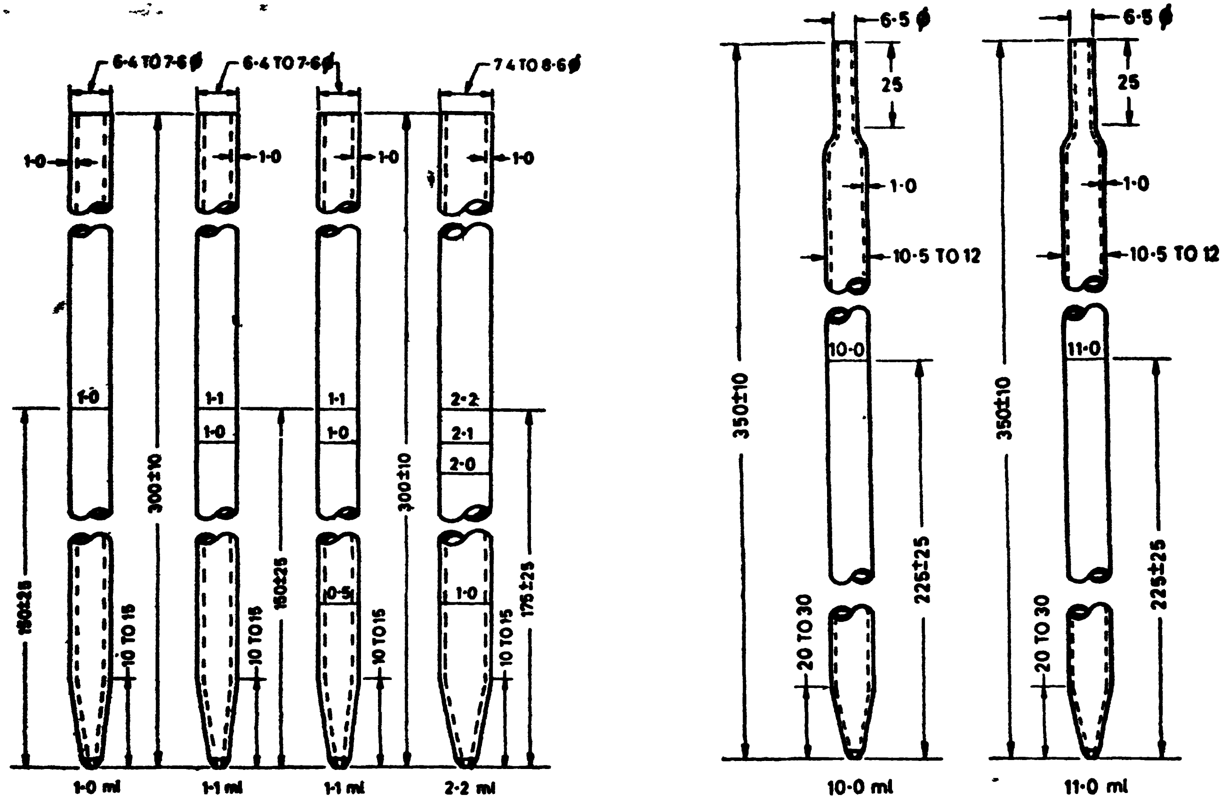
5. REQUIREMENTS

5.1 The pattern of pipettes shall be as illustrated in Fig. 1.

5.2 Material and Workmanship — Pipettes shall be made from heat-resistant, clear glass tubing of good anneal and free from striae, stones, blisters, cracks and clipping and other visible defects as far as possible and capable of withstanding high sterilization temperatures up to 220°C, without resulting in any cloudiness or other defects in the glass.

5.2.1 *Limit of Alkalinity* — The pipettes shall satisfy the requirements of the test for alkalinity prescribed in Appendix C.

5.3 Construction and Finish — The pipettes shall be regular in shape and smoothly finished. They shall be symmetrical about the axis.



All dimensions in millimetres.

FIG. 1 CYLINDRICAL PIPETTES FOR BACTERIOLOGICAL EXAMINATION OF MILK

5.3.1 The jets of the pipettes shall be made with a gradual taper, the taper at the extreme end being slight, so that there is no sudden constriction at the orifice.

5.3.2 The top of the pipettes and their jet ends shall be in planes perpendicular to the axis of the pipettes and shall be smooth and even. Their edges may also be slightly bevelled.

5.4 Graduation — The graduation mark shall be a fine cleanly etched permanent line of uniform thickness not more than 0·1 mm, lying in a plane at right angles to the axis of the pipette and carried completely round the pipette.

5.5 Dimensions — The dimensions of the pipettes shall be as prescribed in Table I.

6. DELIVERY TIME

6.1 The delivery time when determined in accordance with Appendix D shall be within limits specified in item (ix) of Table I.

TABLE I DIMENSIONS FOR CYLINDRICAL PIPETTES

	Capacity of Pipettes in ml				
	1·0	1·1	2·2	10·0	11·0
i) Overall length in mm	300 ± 10	300 ± 10	300 ± 10	350 ± 10	350 ± 10
ii) Distance from graduation mark to tip of jet in mm	150 ± 25	150 ± 25	175 ± 25	225 ± 25	225 ± 25
iii) Length of tapered portion forming jet in mm (Approx)	10 to 15	10 to 15	10 to 15	20 to 30	20 to 30
iv) Length of suction tube in mm (*Min*)	—	—	—	25	25
v) External diameter of suction tube in mm (*Min*)	—	—	—	6·5	6·5
vi) External diameter of pipettes in mm	6·4 to 7·6	6·4 to 7·6	7·4 to 8·6	10·5 to 12·0	10·5 to 12
vii) Internal diameter at tip in mm	1·75 to 2·00	1·75 to 2·00	1·75 to 2·00	1·75 to 2·00	1·75 to 2·00
viii) Wall thickness in mm (*Min*)	1·0	1·0	1·0	1·0	1·0
ix) Delivery time in seconds	3 to 5	3 to 5	3 to 5	5 to 7	5 to 7

7. PACKING AND MARKING

7.1 The pipettes shall be packed as agreed to between the purchaser and the vendor.

7.2 Each pipette shall have permanently and legibly marked on its surface, the following information:

a) Maker's name or registered trade-mark, if any;
b) Nominal capacity followed by letters ' ml ';
c) Letters ' D 27°C ' to indicate that the pipette is calibrated for delivery at 27°C;
d) Delivery time;
e) Inscription ' Milk Bact ';
f) The inscription ' Ref to IS : 2025-1962 ' (*see* Note); and
g) Batch or code number.

NOTE — Under the Indian Standards Institution (Certification Marks) Act, 1952 Section 6 (b), the abbreviation ' IS ' cannot be used without the previous permission of the Indian Standards Institution. Manufacturers intending to use this marking should, therefore, obtain such permission from and register their names with the Indian Standards Institution.

7.2.1 The pipettes may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. Presence of this mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well-defined system of inspection, testing and quality control during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously checked by ISI for conformity to the standard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

APPENDIX A

(*Clause* 3.1)

DETERMINATION OF CAPACITY OF PIPETTES

A-1. PROCEDURE

A-1.1 Clean the pipette thoroughly. Suck distilled water till the meniscus is a little above the graduation mark. Keep the water level at this position by pressing the top of the pipette firmly by a finger. Wipe off all adhering water from the jet end of the pipette by clean dry cloth. Hold the pipette vertically and allow the meniscus to fall slowly by releasing the finger pressure. Allow the water to run out till the lowest point of the meniscus is in the horizontal plane containing the top edge of the graduation mark. Stop the outflow and touch the jet end to the inside of a clean beaker to remove any adhering drop at the jet.

A-1.2 Place a clean, tared, suitable weighing bottle beneath the pipette and touch the tip of the jet of the pipette with the inside wall of the weighing bottle, holding it at a slightly inclined position. Remove the finger pressure from the top of the suction tube and collect the water in the stoppered bottle. Watch the meniscus till it stops moving, the jet remaining in contact with the inside wall of the bottle throughout and then remove the pipette (no attempt shall be made to force out the water remaining in the jet of the pipette). Weigh the stoppered bottle with water and thus determine the weight of water delivered by the pipette. Note the temperature of the water, the air, the barometric pressure and calculate the volume of water delivered by the pipette at 27°C by applying appropriate corrections.

A-1.3 The pipette shall be taken to have satisfied the requirement if the volume of water so obtained is within the limits prescribed.

NOTE — To allow for residual milk and milk dilutions on walls and in tip, pipettes shall be graduated to contain water at 27°C as shown against each capacity.

CAPACITY	TO CONTAIN WATER	TOLERANCE
ml	ml	ml
0·5	0·540	±0·025
1·0	1·075	±0·025
1·1	1·180	±0·025
2·0	2·150	±0·040
2·1	2·255	±0·040
2·2	2·360	±0·040
10·0	10·60	±0·20
11·0	11·60	±0·20

APPENDIX B

(*Clause* 4.1)

SAMPLING PROCEDURE FOR PIPETTES

B-1. SCALE OF SAMPLING

B-1.1 Samples to determine the conformity of a consignment of pipettes to this specification shall be selected in accordance with the procedure given below. However, the purchaser and the vendor may agree to accept any other procedure.

B-1.2 Lot — All the pipettes ~~in~~ a single consignment belonging to the same type and drawn from the same batch of manufacture shall constitute a lot.

B-1.3 Samples shall be tested from each lot for ascertaining conformity of the pipettes in the lot to the requirements of this specification.

B-1.4 A sample of forty-two pipettes shall be drawn from a lot. In case the lot size is less than 42, all the items in the lot shall be drawn. Random number tables shall be used for drawing the samples. If such random number tables are not available, the sample shall be drawn in the manner given below:

> Starting from any pipette in the lot, count them as 1, 2, 3,...,etc, up to *R* in a systematic manner, where *R* is equal to the integral part of $N/42$, *N* being the total number of pipettes in the lot. Every *R*th pipette thus counted shall be separated until 42 pipettes are obtained from the lot to give sample for test.

B-2. CRITERION FOR CONFORMITY

B-2.1 Select at random two pipettes from the 42 pipettes for alkalinity test (*see* **5.2.1**) and test them according to the method given in Appendix C. If the two pipettes pass the test, then only the remaining part of the sample shall be tested for conformity of the lot to the other requirements given in the specification. If the two pipettes fail in the test, no further test need be done and the lot shall be rejected

B-2.2 Capacity — Test the remaining 40 pipettes for capacity, accept the lot if no defective is found and reject the lot if five or more defectives are found. If, however, the number of defectives among the pipettes tested is between 1 and 4, the remainder of the lot shall be tested on hundred percent basis for the characteristic and all pipettes found defective shall be eliminated. For lot sizes less than 42, all the pipettes in the lot shall be tested and the pipettes found defective shall be eliminated.

B-2.3 Visual Inspection — Every pipette in the sample tested for capacity shall simultaneously be inspected for visual characteristics prescribed in **5.2** to **5.4** and all pipettes found defective shall be eliminated and replaced by good ones.

B-2.4 Delivery Time and Dimensions — Tests for these characteristics shall be carried out in stages by taking 8 pipettes at each stage out of the total number of 40, and a decision taken in accordance with the directions given in **B-2.4.1** to **B-2.4.7** read with Table II. When a decision is reached after any stage of sampling, further pipettes shall be not tested. In case the lot size is less than 42, all the pipettes shall be tested for the characteristics and defectives eliminated.

B-2.4.1 The first stage of sampling shall constitute selection of 8 pipettes at random from the total number of 40 pipettes and testing 8 pipettes individually.

B-2.4.2 The lot cannot be accepted at the first stage even if there are no defectives, without further inspection.

TABLE II CRITERION OF JUDGEMENT AT DIFFERENT STAGES OF TESTING

(*Clause* B-2.4)

STAGE	SAMPLE SIZE	COMBINED TEST SAMPLE		
		Size	Acceptance No.	Rejection No.
(1)	(2)	(3)	(4)	(5)
First	8	8	No acceptance possible at this stage	2
Second	8	16	0	4
Third	8	24	1	4
Fourth	8	32	2	5
Fifth	8	40	6	7

B-2.4.3 If the number of defective pipettes found is greater than or equal to the corresponding rejection number (which is 2 at the first stage), the lot shall be rejected without further testing.

B-2.4.4 If the number of defective pipettes found is less than 2, that is 0 or 1, proceed to the second stage and draw another 8 pipettes at random from the remaining 32 pipettes. Examine them and note the number of defectives. Add this number to the number of defectives found at the first stage to obtain the total number of defectives.

B-2.4.5 If the total number of defective pipettes found is less than or equal to the acceptance number (which is 0 at the second stage), the lot shall be accepted without further testing.

B-2.4.6 If the total number of defective pipettes found at the first and second stages together is greater than or equal to the corresponding rejection number (which is 4 at the second stage), the lot shall be rejected without further testing.

B-2.4.7 If the total number of defective pipettes found is between the acceptance number (0) and the rejection number (4) at the second stage, that is 1, 2 or 3, proceed to the third stage and apply the same method. If no decision is arrived at, continue to the fourth and then to the fifth stage till a decision is reached.

APPENDIX C

(*Clause* 5.2.1)

TEST FOR ALKALINITY

C-1. APPARATUS

C-1.1 Erlenmeyer Flasks and Condensers — with ground-glass joints. Erlenmeyer flasks of 250-ml and 500-ml capacities; graduated flasks of 250-ml capacity.

C-1.2 Mortar — a suitable mortar made of steel.

C-1.3 Test Sieves — two, one IS Sieve 40 and the other IS Sieve 60.

NOTE — So long as the Indian Standard Test Sieves are not available, BS Test Sieves or ASA Test Sieves of equivalent mesh sizes may be used (*see* *IS : 460-1953 Specification for Test Sieves).

C-2. REAGENTS

C-2.1 Quality of Reagents — Unless specified otherwise, pure chemicals and distilled water [*see* IS: 1070-1960 Specification for Water, Distilled Quality (*Revised*)] shall be employed in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the experimental results.

C-2.2 The following reagents are required.

C-2.2.1 *Standard Hydrochloric Acid Solution* — 0·01 N.

C-2.2.2 *Ethyl Alcohol or Rectified Spirit* — (a) Ethyl alcohol 95 percent by volume or (b) rectified spirit 95 percent by volume [conforming to IS : 323-1959 Rectified Spirit (*Revised*)].

C-2.2.3 *Standard Sodium Hydroxide Solution* — 0·05 N.

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*Since revised.

C-2.2.4 *Methyl Red Indicator* — Dissolve 0·04 g of methyl red in 75 ml ethyl alcohol or rectified spirit. Add 1·5 ml standard sodium hydroxide solution or a quantity sufficient to ensure that the colour of the solution corresponds to *p*H 5·2 and then dilute to 100 ml with water.

C-2.2.5 *Test Solution* — Add 1·0 ml standard hydrochloric acid solution and 1·0 ml of methyl red indicator to about 240 ml of water. Boil the solution for five minutes in an Erlenmeyer flask which has been previously tested in accordance with the test under **C-3.1**, cool the flask quickly under running water and make up the volume to 250 ml with water.

C-3. TESTING OF ERLENMEYER FLASK ASSEMBLY

C-3.1 Add 1·0 ml of the standard hydrochloric acid solution and 1·0 ml of methyl red indicator to about 240 ml of water. Boil the solution for five minutes in an Erlenmeyer flask of chemically resistant glass (a borosilicate glass of known type), cool the flask quickly under running water and make up the volume to 250 ml with water. Transfer 100 ml of the solution to the Erlenmeyer flask to be tested. Place the flask quickly in a bath of boiling water so that the level of the contained solution is below the level of water in the bath and attach a small reflux condenser. Continue boiling for one hour and at the end of this period observe the colour of the solution. Reject the flask if any change of colour of the test solution has taken place.

C-3.1.1 Erlenmeyer flask assemblies which have once passed the test (*see* **C-3.1**) for suitability ~~may~~ fail to do so after prolonged storage. In such a case they may be revived by washing ~~with five~~ percent (*w/v*) solution of glacial acetic acid followed by washing with water until free from acid, before use.

C-4. PROCEDURE

C-4.1 Take sufficient number of pipettes to get 100 g of glass. Rinse thoroughly with water, dry in a stream of dry air and crush them in such a manner that the particles pass through IS Sieve 60 but fail to pass through IS Sieve 40. The crushing and sieving should be done in three or four stages to avoid too much fines. Spread the sieved particles, weighing in excess of 5 g, on a glazed paper and pass a magnet over them to remove any particles of iron which may have been introduced during crushing. Wash the sieved glass free from dust in an Erlenmeyer flask with four successive 30-ml portions of ethyl alcohol or rectified spirit and dry them at 100°±2°C. Take two Erlenmeyer flasks (*see* **C-3.1**) and transfer exactly 5 g of the sieved clean dry glass to one of the flasks. Transfer a 100-ml portion of the freshly prepared test solution (*see* **C-2.2.5**) to both the flasks. Place the flasks quickly in a bath of boiling water so that the levels of the contained solutions are below the level of the water in the bath and attach the previously tested reflux condensers. Keep the flasks in the boiling water-bath for 30 minutes and then take them out and cool quickly under running water. From the first flask containing powdered glass samples decant out the test solution into a third Erlenmeyer flask. Add 4 ml of water to the powdered glass residue in the first flask, shake a little and decant out into the third flask, taking care to see that transference of the powdered glass is avoided as far as possible. Also add 4 ml of water to the second flask containing only the test solution (blank), titrate the solution in the third flask immediately with the standard hydrochloric acid solution to the pink colour of the blank test solution in the second flask.

C-5. TITRE VALUE

C-5.1 Report the titre value as the number of millilitres of 0·01 N hydrochloric acid solution used to neutralize the extract from 10 g of glass powder minus the titration of the blank. The titre value shall not exceed 1·0 ml.

APPENDIX D

(*Clause* 6.1)

DETERMINATION OF DELIVERY TIME

D-1. DELIVERY TIME

D-1.1 Delivery time is the time taken by the descent of the water from the graduation mark to the point at which it comes to rest in the tip when the pipette is held vertically and the tip is in contact with the inside of a beaker or any other suitable glass vessel.

D-1.2 For determining the delivery time clamp the pipette in a vertical position, fill with water and set on the graduation mark. Place a beaker beneath the pipette and incline slightly so that the tip of the jet of the pipette is in contact with the inside of the beaker. Remove the finger from the top of the pipette and, simultaneously start a stop-watch. Observe the motion of the meniscus down the pipette. The time recorded by the stop-watch up to the period when the meniscus stops descending shall be the delivery time of the pipette.

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